**Project 6**: This project due (electronically by e-mail) by 11:59:59 Tuesday Oct. 18, 2005

A point dipole with a dipole moment of $\mathbf{\mu}$ is at the center of your reference space. The electrostatic potential is a scalar point function and in this situation equals;

$$\psi(r) = \left(\frac{1}{4\pi}\right) \left(\frac{1}{\varepsilon_0}\right) \left(\frac{\mathbf{\mu} \cdot \mathbf{r}}{r^3}\right)$$

where $\mathbf{r}$ is the position vector between the dipole reference space origin and the test charge where the electrostatic potential is calculated.

Using Maxwells' idea of Electric field strength, $\mathbf{E} = -\nabla \psi(r) = -\left(\frac{1}{4\pi}\right) \left(\frac{1}{\varepsilon_0}\right) \left(\frac{\mathbf{\mu} \times \mathbf{r} - 3\mathbf{r} \mathbf{\mu}}{r^5}\right)$

NOW that you have one element of $\mathbf{E}$ push on and show with enough detail that someone can follow your thought process that:

$$\mathbf{E} = \left(\frac{1}{4\pi}\right) \left(\frac{1}{\varepsilon_0}\right) \left[ \left\{ \mathbf{\mu} / |\mathbf{r}|^{3/2} \right\} - \left\{ (3) |\mathbf{r}| \mathbf{\mu} / |\mathbf{r}|^{5/2} \right\} \right]$$